CS111

Discussion 1D - Week 1

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Administrivia

- I’m still awaiting confirmation, but my office hours are **tentatively** set

  Tuesdays from 1-3pm at Boelter 3256S (at Board B)

  If this doesn’t work, we can talk about it.

- **Important:** The CS111 TA’s are **solely responsible for the projects, not course material**. The professor is in charge of all course material, and **I’m not allowed to answer questions that don’t pertain to projects.**

A Compulsory Slide about Myself

- I got my Computer Science B.S. from UCLA last Spring 2019. **I took this class!**
- I'm currently an Computer Science M.S. student through UCLA's ESAP program (guaranteed admission if you meet certain requirements, check it out if interested!). This is my first discussion as a TA!!
- I've chosen the M.S. thesis option, where I'm working on private deep learning. In a nutshell, you can perform deep learning predictions on inputs that are obfuscated; moreover you can train a network on data that is obfuscated!
- I want to pursue a Ph.D. to become a professor at a research university!

Let’s be real. Why Come to Discussion?

- I really think we can make discussion productive for everyone. The hard part is that people have varying levels of understanding of the projects: some want to learn the fundamentals, others want specific help

- I think the following format is a happy medium. Roughly the first half of class we will talk about **how to do the project.** Then after we will **have everyone work on their projects** so we can all help each other do it!

Questions?

Project 0

open and creat

```
int open(const char *pathname, int flags);
int open(const char *pathname, int flags, mode_t mode);
```

- open is a system call that requests access to the file specified by pathname, whose access permissions are specified by flags. For example if I just want read access to a file, I would use `open(pathname, O_RDONLY)`, which returns a file descriptor (an integer) that abstractly represents that file

```
int creat(const char *pathname, mode_t mode);
```

- creat is a specific call of open where the flags are set to O_CREAT|O_WRONLY|O_TRUNC (create file if it doesn't exist, write only access, and make the file empty if it exists and you have write access). The mode argument specifies the read/write/execute access for user/group/other. A simple way to give everyone read/write access it to set mode to 0666.

`close, dup,` and File Redirection

```
int close(int fd);
```

- close takes a file descriptor and asks the OS to close the corresponding file. If it returns 0, success! If it returns -1, then the global *errno* is set to the corresponding error.

```
int dup(int oldfd);
```

- dup returns a second file descriptor for the file referred to by oldfd; moreover this second descriptor is the *lowest nonnegative file descriptor available*. This is useful for file redirection! Say we have input file descriptor *infd*, and we do the following: close keyboard input by close(0), call dup(infd) so that file descriptor 0 now references the input file, and then close(infd). We've successfully rerouted STDIN (file descriptor 0) as the input file!

read and write

```
ssize_t read(int fd, void *buf, size_t count);
```

- read attempts to read *count* bytes from the file pointed at *fd* and places it in *buf*. *count* is an upper bound; the return value will specify how many bytes were actually read (and how many bytes forward the file offset has been incremented). You want to keep reading into a buffer and writing that buffer to STDOUT/output file until the return value is nonpositive (0 means you've reached the end-of-file, -1 is an error and *errno* is set accordingly).

```
ssize_t write(int fd, const void *buf, size_t count);
```

- write attempts to write *count* bytes pointed to by *buf* into the file referenced by *fd*. It returns the number of bytes actually written, or -1 if there's an error and *errno* is set accordingly

exit and signal

`void exit(int` *`status`*`);`

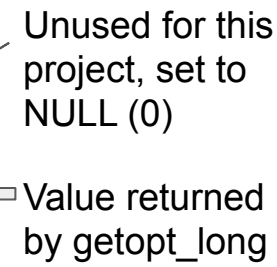
- `exit` simply forces the process to exit and tells the OS the exit code *status*. It is convention that 0 denotes “exited successfully.” The project spec details specific exit codes for specific issues (bad argument, cannot open input/output file, caught segmentation fault)

`sighandler_t signal(int` *`signum`*`, sighandler_t` *`handler`*`);`

- `signal` tells the OS that if the signal corresponding to *signum* occurs, invoke the function *handler*, which is given the (single) argument *signum*. To tell the OS to run some function `foo(int sig)` on a segmentation fault, invoke `signal(SIGSEGV, foo)`

getopt_long

```
static struct option long_options[] = {
     {"create",  no_argument,       0, 'c'},
     {"file",    required_argument, 0, 'f'},
     {0,         0,                 0,  0 }
};
```




```
while((c=getopt_long(argc,argv,”cf:”,long_options,NULL)) != -1) {
     switch(c){
          case ‘c’: // create
               break;
          case ‘f’: // file
               //global variable ‘optarg’ set to the corresponding argument
               break;
          default: // unknown, error!
               exit(1);
     }
     // Done with argument! Loop to get next arg (or exit if c == -1)
}
```

gdb

First, **make sure you compile your program with -g** (this compiles your program with debug symbols attached to the executable, so gdb has knowledge of the source code). To start gdb, run "`$ gdb ./lab0`". You then have the following commands at your disposal.

- b <function or line number> - sets a "**break**point" so that execution of the program halts when the function or line is reached
- r <arg1> <arg2> … - **run** the program from the beginning with given args
- n - execute the **next** line in the source code
- c - **continue** execution until hitting a breakpoint or the program terminates
- bt - print the **backtrace** (i.e. the current call stack)
- p <variable or assignment> - **print** the value of a variable (if you write an assignment like "p i = 2" then it will set the variable i to 2 in your program!)
- info locals - print all **local** variables in scope
- l - **list** out the lines surrounding the current line of execution

gdb demo!